5974.85

Research
Library

No. 5974.85

THE TRUSTEES OF THE PUBLIC LIBRARY OF THE CITY OF BOSTON 1852 1878

GIVEN BY

Rufus P. Williams

F MAR 14

APR 30

DEC 14

JUN 4

JAN 10

A. MAY 9

NOV 18 [illegible]

APR -1 1941

NOV 18 [illegible]

DEC 16 [illegible]

Digitized by the Internet Archive
in 2010 with funding from
Boston Public Library

http://www.archive.org/details/plantingofchemis00will

BOSTON PUBLIC LIBRARY

5974,85

Reprinted from the April–May (1902) issues of SCHOOL SCIENCE.

Rufus P. Williams,
June 3, 1902.

THE PLANTING OF CHEMISTRY IN AMERICA.

BY RUFUS PHILLIPS WILLIAMS.

There were half a dozen centers for the early dissemination of chemical knowledge in this country. The first planting of the science on our shores was in connection with anatomy and materia medica, and but for medical schools chemistry teaching would have been delayed for many a decade. Down to the year 1765, there was not a school of medicine on the American continent, and all physicians must necessarily study in Europe where the profession had been recognized for some 2,200 years, and where medical professors still gave their lectures in the Latin language. The honor of establishing the first such school here belongs to Philadelphia. This was natural, for during the last half of the 18th century, and for many years afterwards, the Quaker City was the Mecca of science as well as of literature. Here the first scientific society in America—The American Philosophical Society—was established in 1766, with Benjamin Franklin as president. A similar organization, due to the efforts of John Adams, was founded in Boston fourteen years later. This was the "American Academy of Arts and Sciences." It may be mentioned that the only foundations for science work in the Republic when Washington became President were the two societies named above, one natural history museum, one botanic garden and one private astronomical observatory. The first patent under the new government was for a chemical process, to make "pot and pearl ashes," granted to Samuel Hopkins of Vermont, in July, 1790.

Backward as science seems to have been, it was perhaps not much more so than other subjects. Charles Kendall Adams says that it was "nearly two centuries after the founding of Harvard College before the study of history in that institution had any standing whatever. It was not till 1839 that the study of history in any American college was first encouraged by the endowment of a special chair." Harvard had that first chair and Jared Spark occupied it.

New York.

Though Philadelphia was the home of the earliest medical school, the first professorship in chemistry appears to have been created in New York in 1767. Previous to this, some little instruction in medicine had been given to young men; the earliest recorded lectures being by Dr. John Bard and Peter Middleton in New York City. However, the first attempt to organize a medical school there was in 1767, and August 14 of that year one Dr. James Smith, brother of William Smith, the historian, was appointed professor of chemistry and materia medica, teachers in other branches being also chosen at the same time. The school was not opened till the following year, when it was placed under the direction of the College of the Province of New York, but was broken up by the Revolution and not reörganized till 1792. Smith's term of service began in 1768 and ended in 1770, but his distinction is that of being the first regularly appointed professor of chemistry in America. The reörganized institution was called Columbia College. There were at this time (1792) 55 registered physicians in New York City. In 1807 was chartered the College of Physicians and Surgeons, and Columbia then became an academic institution.

Pennsylvania.

In 1765, through the efforts of two physicians, there was opened in Philadelphia the first medical school in the colonies. It was in connection with the College of Philadelphia, sixteen years after the founding of the latter institution. Still there was no chair of chemistry till August 1, 1769. This date is interesting as exactly five years, to a day, prior to Priestley's classic discovery of oxygen, which led the way a few years later to the establishment of scientific chemistry. It was also a year after Professor Smith's first lecture in New York. Before the school was opened, the requirements provided that chemistry should be taught, but there was no apparatus, and apparently no person qualified to give instruction. Dr. Benj. Rush was the first professor. When he went abroad and brought home as a present from "the Proprietary of Pennsylvania"—Thomas Penn—a set of chemical apparatus, it was such a novelty that the fact was widely advertised. This was 133 years ago. "When the Medical School was founded the science of chemistry was little more than a knowledge of some acids, alkalies, salts and earths, of which the most important ingredients were unknown. The composition of air and water was not understood. Oxygen, hydrogen and nitrogen had not been discovered."

The Revolution broke up the medical school as early as 1779, and but little is known of Dr. Rush's success as a demonstrator. Ten years later the University of Pennsylvania sprang into existence and there were two institutions in place of one, each having its professor of chemistry. For some time but little can be recorded besides the names of those who successively held the respective positions. Rush had been transferred from furnaces and retorts to the theory and practice of medicine, and one, Dr. Caspar Wistar, took his place as professor of chemistry in the medical school of the college; Dr. James Hutchinson occupying a similar post in the university. When in 1791 the college was merged into the university, Wispar was transferred to another department and Hutchinson retained the chemistry. On the death of the latter, three years later, the famous discoverer of oxygen, Joseph Priestley, who had just arrived in this country, was unanimously elected to the position, November 11, 1794. Priestley declined the offer, and no wonder, after a long life filled with political and religious strife which ended in his house being burned and himself driven from England. Not till the following year was the office filled, and then by the first man who seems to have made a marked impression in his specialty. This was Dr. James Woodhouse, elected July 7, 1795. He held the post till his death, fourteen years later. Of his first year it was said: "He went to work with zeal and delivered a course of lectures with great applause. As almost the whole of his time was devoted to the study of chemistry, he constantly added to the number, variety and brilliancy of his experiments. His enthusiasm was unbounded and his style sentimentally impressive." Priestley called him the equal as an experimenter of any one he had seen in England or France. Chemistry teaching at that time consisted, besides recitations, of lectures and experiments by the professor before the class. There was no mention of laboratory work for half a century. Thomson says of a still later period of the science: "Chemistry at that time did not possess a single analysis which could be considered as even approaching to accuracy." The central idea by which all experiments were explained was the "phlogiston theory" founded by Stahl in 1702. It had held its place among English chemists for a century. It was a well established canon and practically all chemists believed the doctrine. It taught that every combustible body is a compound of a very subtle substance called *phlogiston* united to a calx, or an acid; that when a substance like carbon or sulphur burns, the flame shows the escape of phlogiston, and that any residual ash is the calx or the acid, left after the expulsion of phlogiston. It was a first attempt to explain chemical phenomena scientifically, and its advent, absurd as it now seems, was a great advance over the doctrines of alchemy.

But Lavoisier, in 1778, showed that in combustion something united with the burning material and that the something was oxygen, discovered by Priestley four years before; the fact that the substance increased in weight after burning he explained by its union with oxygen and proved that the loss in weight sustained by the air is equal to the gain in weight of the substance formed. The new chemistry gained an easy foothold in France, but not in England. Cavendish adhered to the Stahlian view, and the last chemical paper ever written by Priestley, 1803, was a defence of this theory. Woodhouse explained his brilliant experiments by phlogiston, but he was the last American professor to inculcate the doctrine.

As Philadelphia was the center of chemical study in America, Woodhouse became the teacher of teachers. Hither came Silliman, who had been appointed, in 1802, to dispense the magic art to the students of Yale, and Robert Hare—destined to surpass his master—was a student under Woodhouse. These two young men, soon to be the leaders of science in their generation, occupied the same room, performed together the experiments of their instructor, and studied phlogiston. When Woodhouse died, in 1809, the theory went out with him, and his successor, Dr. John Redman Coxe, taught according to Lavoisier. It was this Dr. Coxe who believed so fully in the efficacy of vaccination that he exposed his vaccinated infant child to smallpox, thus doing much to overcome the popular prejudice. Dr. Robert Hare, who was an unsuccessful candidate for the chair filled by Coxe, was the ablest of all the American chemists of that day, and when Coxe was transferred in 1818, he was appointed in place of the latter, having a few months previously accepted a like position in William and Mary College. He was accounted the most brilliant demonstrator of his time. After a service of 27 years he resigned at the age of 66. A report of the faculty in 1841 reads: "The chemical apparatus is, by the admission of all who have inspected it, unequaled in extent, variety and splendor. Individuals who have visited the schools of Germany, France and Great Britain agree in the statement that they have nowhere met with a laboratory so amply furnished with all that is calculated to illustrate the science of chemistry, as that of Dr. Hare." This apparatus was largely his own invention and make. On his resignation it was given to the Smithsonian Institution, but, unfortunately, was entirely destroyed by fire in 1865.

When but twenty years old, this talented young man made one of the greatest inventions of the century, for which he was awarded the Rumford medal. It was the oxy-hydrogen blowpipe, then called the *hydrostatic blowpipe*. No temperature had ever approached that obtainable by its use, which made possible the fusion and working of platinum and other refractory metals, and opened up a new field of industry. Down to that time large "burning glasses" and huge reflecting mirrors were the chief reliance for the highest temperatures. The oxy-hydrogen flame has stood for a century as the highest heat attainable by combustion, though far outstripped in recent years by the heat of the electric furnace. Hare's invention dates from 1801. With it he experimented before Priestley, Woodhouse, Silliman and other *savants* and accounts of it were published in the press of America and Europe. Professor Silliman later said: "With Mr. Hare's blowpipe I melted lime and magnesia and a long list of the most refractory minerals, gems and others, the greater part of which had never been melted before."

In electrical invention he was no less successful. Faraday, in 1835, having exhausted his resources in trying to make a satisfactory voltaic battery, found that Dr. Hare had nearly twenty years before accomplished that end; he accordingly adopted Hare's "calorimotor," as the battery was called by its inventor.

Pharmacy was indebted to Hare for denarcotizing laudanum and for detecting minute quantities of opium in solution. In theoretical chemistry he strongly attacked Berzelius's "salt radical theory." He was "remarkable for the scale of his experiments, which were uniformly successful and impressed the mind by their grandeur." His robust frame, imposing figure and large head; his graceful language, graphic descriptions and imaginative style; the originality of his experiments and the variety and extent of the apparatus employed all combined to make Hare one of the greatest of America's chemistry teachers. He also wrote much, his contributions to the American Journal of Science being for many years more numerous than those of any other writer. 48 volumes of that journal contain 150 articles by him, besides which he wrote an elaborate text book of chemistry and various other works.

Virginia.

In 1776, the College of William and Mary in Virginia was the wealthiest and most influential of all the American institutions of learning, but during the Revolution all its endowment, except $2,500, was lost by the depreciation of paper currency. The school suspended operations in 1781 and the buildings were burned. The first mention in the college records of a professor of chemistry is in the year 1774, and the Rt. Rev. James Madison was that professor. Chemistry appears to have been his only subject and the record is silent as to his term of service, but according to the autobiography of Thomas Jefferson, it must have been a short one. Jefferson was appointed governor of the commonwealth June 1, 1779, being elected also one of the visitors of the college. He says: "I effected during my residence in Williamsburg that year, a change in the organization of that institution, by abolishing the grammar school and the two professorships of divinity and oriental languages, and substituting a professorship of law and policy, one of anatomy, medicine and chemistry, and one of modern languages." Dr. James McClurg held the second of these posts created by Jefferson—presumably till the breaking up of the college. It thus appears that the Virginia college was the third institution to employ a teacher of chemistry; in fact it was the first one to teach the subject to under-graduates alone, not as an adjunct to a medical school—unless, indeed, the creation by Jefferson of a professorship in anatomy, medicine and chemistry constituted such a school. After an interval of over thirty years, the record shows the next teacher to have been Dr. James McLean, professor of Natural Philosophy and Chemistry, in 1812. This "college of statecraft," at which three of the four first Presidents of the United States graduated, has had some eminent teachers of chemistry, but the subsequent development of science at William and Mary does not specially pertain to the subject of this article.

Massachusetts.

The first steps leading to the establishment of a medical school in New England were taken by the Boston Medical Society, of which Dr. John Warren was the moving spirit. This was in 1780, but the plan was not matured till two years later, although Warren in his enthusiasm gave meantime some lectures on medicine at his residence. This school was to have among other things a professorship in chemistry and materia medica and Dr. Aaron Dexter was appointed to the chair. It was decided to have the institution located in Cambridge, and, besides the regular students in medicine, to allow such college seniors to attend as "had obtained consent of their parents." The school opened in 1783, and boasted one graduate each year for the first four years of its existence, though a small number more attended the lectures. Previous to 1813, there was an average of two to three graduates per year.

It should be remembered that the communication between Boston and Cambridge previous to 1786, when the bridge was built, was by ferries or a long detour by land. Dexter seems to have left little record except that of "an eminently respectable character," and in 1809 Dr. John Gorham was appointed adjunct professor of chemistry and materia medica.

In the fall of 1810, the medical school was transferred to Boston, the first lectures being given in the house of Dr. Warren. But the connection with Cambridge was only partially severed, as it was provided that some lectures should be given at the college. This in later years became the cause of much vexation, for the same chemical apparatus was used to a large extent in lectures in both Cambridge and Boston, and every year it had to be carried over the Charles River from medical school to college, back and forth. This continued till 1858, when a separate professor was appointed for each institution. In the early years this transportation was not so irksome for the number of chemistry lectures given at the college was very small and the science formed but a minute part of the liberal education of a Harvard student during the first half of the 19th century.

In 1846 the medical school was transferred from Mason street, where it had been for more than thirty years, to a new building in North Grove street, and ultimately a chemical laboratory was constructed in the basement and fitted for 138 students. Each student had "his own place and his own apparatus for practical work in analysis and other chemical processes." This plan, so universally adopted half a century later, was then a great innovation, but even here the laboratory was not used much for several years. Dr. John W. Webster was then professor of chemistry at both the medical school and the college, having been appointed in 1827 to succeed Dr. Gorham, as Erving professor of chemistry and mineralogy in Harvard. The year before his appointment, Webster wrote a voluminous, well illustrated text book of chemistry, which ran through three editions. His term of service of twenty-three years as professor was terminated by his resignation in 1850 and his execution the same year for the murder of Dr. Parkman nine months before. The amount of chemical knowledge obtained in those days may be inferred from the description of one of his lecture courses in the college. He "gave the class two or three chemical lectures, which were brought to a sudden end by his show experiment called *the volcano*—a large heap of sugar and potassium chlorate piled on a slab of soapstone. After he had lighted it with a drop of sulphuric acid, he saved himself by dodging out of the room and in a very few seconds all the members of the class found themselves obliged to jump out of the window." Professor Horsford later gave a voluntary course of three lectures. Such instruction after almost three-fourths of a century of chemistry in the college shows that science was not greatly fostered. In truth "chemical teaching in Harvard College had become extinct." The laboratory method invented by Liebig early in the century and introduced into the universities of Europe, was slow in being put into operation here. It was for Webster's successor, Josiah P. Cooke, to inaugurate this revolutionary change and to place chemistry on a par with classical studies.

When in 1848 Eben Horsford—a student under Liebig—was appointed professor of chemistry at the Lawrence Scientific School, just opened, he brought with him from Giessen the laboratory method of his illustrious master. The new building was at first entirely given up to chemistry and "a laboratory unsurpassed in Europe even at that time, for convenience for practical instruction, was erected and furnished." At practically the same time, Louis Agassiz was called to the chair of geology and zoölogy in the same institution. This was twenty-three years before the scientific school became a part of the university, but both Agassiz and Horsford introduced a new system of teaching—instruction by the laboratory method—and in both cases the student was mainly thrown on his own resources. This method proved more successful in natural history than in chemistry. Professor Chandler, one of the pupils in 1853, describes the latter as follows: "There were about a dozen students in the laboratory, of whom half were beginners. We were given Will's Qualitative Analysis, and were set at work upon the 'hundred bottles'. After we had finished them, we began to make quantitative analyses, but we soon met a difficulty, which at that time prevailed generally in the United States; it was the lack of any systematic, organized course of study for the chemical profession. We were simply turned into the laboratory. There was no regular graded course of study, consisting of two, three or four years, including not only chemistry, theoretical, analytical and industrial, but other studies necessary to the young chemist. As a matter of fact, there were no lectures on chemistry at all for the students of the scientific school. We were expected to provide ourselves with text books and study them by ourselves at home." The number of students of science was small and all were special students. From its opening down to 1872, when it became a part of the university, degress in chemistry had been conferred on only 55 persons. Professor Horsford resigned in 1862 for the larger emoluments of manufacturing chemistry.

Among the young men who saw the volcano experiment, mentioned above, and made an exit through the nearest window, was one who was to take front rank in America among teachers and investigators in the science. The environment was not promising. But long before entering college he had done more experiments than were laid down in the curriculum. As a boy, Josiah Cooke had read that fascinating work of Mrs. Marcet, called *Conversations on Chemistry*—a book which for nearly half a century kept issuing from the press and stirred more youthful minds in England and America than perhaps any other chemistry ever written. Later, when Professor Silliman of Yale in 1840 gave a course of chemical lectures with experiments, at the Lowell Institute in Boston, Cooke was an earnest listener. At his Boston home he improvised a laboratory, made and set up his own apparatus and repeated the Lowell Institute experiments with many others culled from Turner's Chemistry. The half dozen lectures during the college course did not profoundly add to knowledge obtained in this manner. And so we learn with some surprise that in 1849, the year after his graduation, he was appointed instructor in chemistry and mineralogy, and in 1850 was appointed to the chair made vacant by the hanging of Webster. He was then 23 years old, had had a teaching experience of little over a year and won the position in competition with David A. Wells, the afterwards distinguished political economist. The college had no apparatus, and Cooke furnished what he used from his private laboratory. Then he went for a few months to Europe and bought apparatus and chemicals at his own expense for both medical school and college. The task was difficult. Science teaching was not favored by college faculties or overseers. There was a small lecture room but no laboratory. All that was required was a few lectures. But Cooke started a humble laboratory in a small basement room below his lecture hall and invited a few students to experiment with him. There was no running water nor gas. Charles W. Eliot, afterwards professor of chemistry at the Massachusetts Institute of Technology and now president of Harvard, was the first student admitted to this little first laboratory, and F. H. Storer, since eminent as an agricultural chemist, was another. Seven years later, laboratory work was made a requirement for college students studying chemistry. By 1853, Cooke had equipped the medical school in Boston so as to take a few pupils in qualitative analysis. "It is believed that this was the beginning in the United States of laboratory instruction in chemistry for medical students."

Professor Cooke was an indefatigable worker. His researches in atomic weight, classification of elements, specific gravity, mathematical crystallography, and in other lines, as well as his many publications, gave him an international reputation. His *New Chemistry*, first issued in 1874, was "translated into all the civilized languages of the globe." With all his attainments he was a self-made chemist, having "never worked for an hour in any laboratory but his own." For nearly half a century he was head of the chemical department of Harvard. He saw it rise from almost nothing to one of the largest departments in the university; from a cellar corner to a large three-story granite building, now completely filled with laboratories and lecture rooms; from recitations of what others had done or might do to elaborate research in every branch of chemistry. "Professor Cooke created the Chemical and Mineralogical Department of Harvard University."

New Jersey.

The first professorship of chemistry at the College of New Jersey—now Princeton—was created October 1, 1795, and Dr. John Maclean was appointed to fill it. He was a young physician and chemist who had studied at Glasgow, London and Paris, and had come to America, locating in Princeton, where he was practicing medicine. Imbued with the theory of Lavoisier, it seems probable that he was its first teacher in this country. Before his appointment he had been invited to give a course of lectures on chemistry in the college. This course made such an impression on the faculty that at the very next meeting he was elected. It has been claimed that, aside from chairs of chemistry in the various medical schools of Philadelphia, New York and Cambridge, this was the first professorship in that science primarily for under-graduates, unless such professorship included natural philosophy or mathematics. The records of William and Mary College dispute this claim. Besides his lectures, Professor Maclean was allowed to continue to practice medicine, until the death of Dr. Minto, in 1797, at which time it was "ordered that chemistry and natural history be taught as branches of natural philosophy," and Maclean devoted his entire time to the college—this step being in accord with the usage of the times.

An account given by one Dr. Alexander of a visit to Princeton in 1801, was that "Dr. Maclean emigrated to America in 1795 and became one of the most popular professors who ever graced the college. He was at home almost equally in all branches of science. Chemistry, natural history, mathematics and natural philosophy successively claimed his attention." He was a native of Glasgow and entered the university in his thirteenth year. While a student there be and some of his companions formed a chemical society, several of whose members afterwards rose to eminence. A book, *Lectures on Combustion,* which upheld the principles of Lavoisier as opposed to phlogiston, was from his pen, as were several papers in opposition to Priestley's views, published in the *New York Medical Repository.* Professor Silliman said of him: Dr. Maclean was a man of brilliant mind with all the acumen of his native Scotland, and a sparkling of wit gave variety to his conversation." In 1812 he resigned to accept a position elsewhere.

Connecticut.

The teaching of chemistry in Yale was not as an adjunct to medicine. For this reason it did not gain a foothold till the 19th century. In 1798 the president and fellows of Yale voted that a professorship of chemistry and natural history be instituted as soon as there were sufficient funds. It was four years ere the funds materialized. Benjamin Silliman was a graduate of the college, had been a tutor in it, and had finally settled upon the legal profession for a life work. There were scarcely any scientific books, there was no apparatus, and Silliman "had not learned the rudiments of science." But President Dwight's acumen saw in him a scientific diamond, and he finally persuaded him to abandon the law and accept the newly made chair of chemistry and natural history. The young professor in 1803 went to Philadelphia—almost the only place in America where he could study the subject to advantage—attended the lectures of Woodhouse and experimented together with his companion, Hare. On his way to the Quaker City he stopped at Princeton and made the acquaintance of Professor Maclean, of whom he afterwards said: "I regard him as my earliest master of chemistry, and Princeton as my first starting point in that pursuit, although I had not the opportunity to attend any lectures there." Years afterwards, while visiting the laboratory at Princeton, Professor Silliman remarked: "It was in this room that I saw the first experiments in chemistry ever witnessed by me." Next year he began lecturing to the students of Yale College, but, feeling his own deficiency in subjects of which he had set himself up to be master, he went abroad in 1805 and attended lectures mainly in London and Edinburg. After an absence of little over a year, he entered upon that brilliant career in education and journalism which continued for half a century. Eminently a teacher and popularizer rather than a discoverer, he was "almost the father in this country of the three sciences in which he gave instruction. For many years the study of chemistry was the most popular one in college." The first third of the year was devoted to chemistry, the second to mineralogy, the last to geology. With an unusual assiduity he taught these subjects year after year with scarcely a break—except during one year of sickness—till 1851, when he took a second European trip. From 1835 to 1840 he gave popular lectures in many large cities from Boston to St. Louis and New Orleans. It was at one of these courses—the first lectures ever given at the Lowell Institute, January, 1840—that young Josiah Cooke gained the inspiration to follow science as a profession.

When Silliman entered upon his duties at Yale, there were "only minerals enough to fill a candle box," but he at once set about securing more, and finally after great effort he raised $20,000 and bought the Gibbs cabinet—then the best mineral collection in the United States.

Realizing the need of a periodical which should give the latest discoveries and inventions in science, especially in the three which he taught, he began in 1818 the publication of *Silliman's Journal*, afterwards called the *American Journal of Science*. Pecuniarily it was a losing venture, and for years the struggle for existence was severe, but it had been founded for science, not lucre, and it soon became the leading organ of its kind. In its pages for the major part of the century one can find the tabs of scientific progress. In 1830 he issued a text book of two octavo volumes. Here, in the history of education, the great teacher of chemistry in the college was the first one. For more than fifty years he was a member of the faculty, resigning in 1853, though he continued his lectures two years longer, his son being then appointed in his place.

New Hampshire.

It was more than quarter of a century after Wheelock in 1770 built the "log hut about eighteen feet square, without stone, brick, glass or nails," which formed the beginning of Dartmouth College, that the first suggestion of a school of medicine was made. Dr. Nathan Smith in 1796 proposed to the trustees to give medical lectures to the students. Next year the lectures were given, and the following year a department of medicine was established by the election of Dr. Smith "Professor of Medicine." He was the veritable autocrat of that school, being clothed with the "power to employ assistants according to his wishes." The northwest corner of the lower floor of Dartmouth Hall was set apart for his use and constituted the medical school. The first course opened November 22, 1798. He selected as the lecturer on chemistry Dr. Lyman Spalding, a graduate of the Harvard school, class of 1797. Spalding evidently had been trained in the doctrine of Lavoisier, for we read that he had printed for his class "A New Nomenclature of Chemistry, proposed by De Morveau, Lavoisier, Berthollet and Fourcroy, with Additions and Improvements." Other lecturers on chemistry who followed Spalding were Rufus Graves, Esq., and Dr. Daniel Oliver, but there was no established chair until 1820. That year there was founded a "professorship of chemistry, mineralogy and the application of science to the arts." Dr. James F. Dana was appointed, who held the place for half a dozen years, and was succeeded in 1827 by Rev. Dr. Benjamin Hale, who—on account of espousing the Episcopal faith with too much ardor for the orthodox college—lost his position in 1835 by the abolition of the professorship, which, however, was restored next year, Dr. Oliver Payson Hubbard being appointed to the place. In Hale's valedictory letter to the trustees on the loss of his chair, one gets a spicy insight into the scientific apathy of the age. In it he says: "It is a remarkable fact that there is not one member of your board whose pursuits in life lead him to any acquaintance with physical studies, and I presume the importance absolute and relative of such studies is viewed by you as it stood in American colleges from thirty to fifty years ago when you were undergraduates. And your college feels the effect of this deficiency. It has not taken a scientific periodical, so far as I know, for half a century. The few that have crept into your library you owe to the charity of a pamphlet society which, through the influence of the late Professor Dana, among its other periodicals took one *Quarterly Journal of Science,* and at its decease bequeathed its collection to your library. Since its death, no report of the progress of science finds its way within your walls, save the *Journal* of Professor Silliman, taken by the two respectable societies among the students * * *" "A few years ago, no provision was made for chemical lectures to college classes, and members of the higher classes were in the habit of making a contract annually with my predecessor, Professor Dana, for the privilege of attending his lectures." Before Hale's advent, seniors were allowed to attend lectures on chemistry and anatomy on payment of $4 per year, juniors $2. Afterward seniors and juniors were allowed to attend the fourteen or fifteen weeks of daily lectures which Hale delivered to the "medics". Hale also had five or six weeks of daily recitation with the junior class, and gave to the undergraduate college students a separate course of thirty lectures per year. He established a course of twenty lectures in geology and mineralogy, and collected a cabinet of some 2,300 minerals where there were none before.

Dr. Hubbard, the successor of Hale, had one of the longest careers in the profession, his term as professor of chemistry in the Dartmouth Medical School lasting for forty-seven years, ending in 1883. Meantime, science in the college had been divorced from that in the medical school, each having its own chemical teacher.

Thus were planted in seven early institutions of learning in this country the seeds of that science which in little over a century has grown to enormous proportions. In tracing its origin and growth in these American centers, more space has been given to some because of the greater personality of the early educators and the more ample records available. Among all these men, three—Hare, Silliman and Cooke—pre-eminently distinguished themselves and gained a world-wide reputation.

Our research has shown that the first medical school in America was opened in 1765 in Philadelphia; that the first professorship of chemistry was established in 1767 in New York, with Samuel Smith as first professor; that the first professor of chemistry outside of a medical school was James Madison, of William and Mary, in 1774; that the first teaching of anti-phlogiston (i. e. of Lavoisier's chemistry) was probably in 1795, at Princeton by Dr. John Maclean; that Dr. James Woodhouse of Philadelphia was the last man, 1809, to inculcate the phlogiston doctrine; that laboratory instruction was introduced in 1848 by Eben Horsford at the Lawrence Scientific School; that the earliest laboratory instruction in medical schools was given in 1853 by Professor J. P. Cooke, at the Harvard Medical School.

Boston Public Library
Central Library, Copley Square

Division of
Reference and Research Services

The Date Due Card in the pocket indicates the date on or before which this book should be returned to the Library.

Please do not remove cards from this pocket.

BOSTON PUBLIC LIBRARY
3 9999 06609 085 1